(19) Japanese Patent Office (JP)

(12) PATENT DISCLOSURE BULLETIN (A)

(11) Patent Application Disclosure No.: Patent Disclosure

58-213646 (1983)

(43) Disclosure Date: December 12, 1983

(51) Int.Cl[3] Identification Symbol

C03B 37/00

//G02B 5/14

Patent Office Assigned Number

6602-4G

7370-2H

Search Request: Not yet made

Number of Invention: 1 (Total page: 3)

---

(54) Subject of Invention Manufacturing Method of Optical Fiber

(21) Application Number : Patent Application 57-96012 (1982)

(22) Application Date: June 4, 1982

(72) Inventor: H. Nakahara

c/o Ibaraki Electric Communication Research Lab

Nippon Telegraph and Telephone K K

162 Oaza-Shrakata-Azahakune, Tokai-mura,

Naka-gun, Ibaraki-ken

(72) Inventor: ?. Meshino

Cable
c/o Chiba Electric Manufacturing Plant

Furukawa Electric Industry K K

6 Kaigan-dori, Yahata, Ichihara City

(72) Inventor: S. Nishimoto

Cable
c/o Chiba Electric Manufacturing Plant

Furukawa Electric Industry K K

6 Kaigan-dori, Yahata, Ichihara City

(72) Inventor: M. Nishimura

Cable
c/o Chiba Electric Manufacturing Plant

Furukawa Electric Industry K K

6 Kaigan-dori, Yahata, Ichihara City

(72) Inventor: Y. Oishi

Cable
c/o Chiba Electric Manufacturing Plant

Furukawa Electric Industry K K

6 Kaigan-dori, Yahata, Ichihara City

(71) Applicant: Nippon Telegraph and Telephone K K

(71) Applicant: Furukawa Electric Industry K K

6-1, 2-chome, Marunouchi, Chiyoda-ku, Tokyo

(74) Agent, Attorney: M. Ito

DETAILED DESCRIPTION

1. Subject of Invention

Manufacturing method of optical fiber

2. Scope of the Patent Claim

(1) A manufacturing method of optical fiber having the following characteristics: to the outer circumference of optical preform, a coating layer based on inorganic system adhesive is formed; and after this the (adhesive) layer is hardened, the optical fiber preform is spun (drawn) into fiber.

(2) In the manufacturing method of optical fiber described in Claim Item (1), the inorganic system adhesive is composed of at least one kind as major component selected from alumina, zirconia, graphite, silica, magnesia, zircon, silver, copper.

(3) In the manufacturing method of optical fiber described in Claim Item (1), the inorganic system adhesive is composed of, as secondary component, a thermal (heat) hardening resin.

(4) In the manufacturing method of optical fiber described in Claim Item (1), the inorganic system adhesive is either strongly alkaline nature or strongly acidic nature.

3. Detailed Explanation of the Invention

The present invention is related to a manufacturing method by which an optical fiber of high strength can be manufactured.

As already known that the optical fiber to be used in optical communication, etc. is manufactured by spinning (heat-elongation) of an optical fiber preform (also called as preform rod) of quartz glass system, multi-component glass system, etc.

In general, optical fiber is a long length glass fiber of about 100 micron in outer diameter. Therefore, it can be said that it is poor in mechanical properties; however, at least, it could achieve close to the theoretical strength.

Nevertheless, the separation between the actual strength and the theoretical strength is not too small. For the reason of this, it has been pointed out that during the spinning (fiber drawing) process of the optical preform, impurities would adhere to the surface, and by the impurities, surface scratches would be generated.

Of course, as a countermeasure to this, it has already been proposed to carry out the aforementioned fiber spinning (drawing) process in a clean air or inert gas atmosphere. Furthermore, after the fiber-drawing, applying of a high strength metallic oxide coating onto the optical fiber is being performed.

When these countermeasures are applied, the optical fiber strength would certainly improve; however, a high degree of mechanical performance corresponding to the cumbersome operation required has not been shown.

In regard to this, it can be said that there is a limitation in the aforementioned cleaning measure and the adhesion of the unavoidable impurities and/or surface scratches would occur. Further, under this condition, even if a coating of metal oxide is applied, it would not be effective in removing the impurities or eliminating the surface scratching.

The present invention is to address the aforementioned problematic points: at the step of the optical fiber preform, a special coating is applied to the outer circumference of the preform; and then, it is spun (fiber drawn) to produce an optical fiber of high strength. Below, a concrete method is illustrated based on the implementation example shown in the figures.

In Fig 1, 1 is the optical fiber preform, and 2 is the coating layer formed onto the outer circumference of the preform 2 (Translator's note "2" is misprint of "1").

The aforementioned optical fiber preform 1 is composed of a quartz glass, multi-component glass, etc.; and the coating layer is composed of an inorganic system adhesive.

The inorganic system adhesive to be used here is composed of at least one kind as major component selected from alumina, zirconia, graphite, silica, magnesia, zircon, silver, copper and a thermal hardening resin as secondary component.

And, the inorganic materials listed above are in powder shape or fine fiber shape; they are kneaded into the thermal hardening resin with a suitable mixing ratios.

As a concrete example of the inorganic system adhesive, the Cerambond 503 or the Cerambond 550 manufactured by the US Aremco Company can be listed.

In the present invention, first of all, the optical fiber preform 1 is coated with the above described inorganic system adhesive; by this, the coating layer 2 in several um thickness is formed. For doing this, the application means (method), the soaking method, the spray method, etc. already known methods can be employed for the coating. After this, the optical fiber preform 1 under the coated condition is heated in an electric furnace to about 500-600 degree C to harden the aforementioned coating layer 2.

During this, the electric furnace inside is maintained in clean condition by clean air, inert gas, etc.

Next, the aforementioned optical preform after the coating layer 2 is formed, as shown in Fig 2, is introduced into the fiber-drawing furnace 3 (for example, a carbon resistance furnace) and drawn into fiber (heat-elongation); the obtained optical fiber 4 is applied for further coating in the next step by the coating bath 5.

Furthermore, a new coating film 6 would be formed by passing through the coating bath 5 to the outer circumference of the optical fiber 4; for this material, silicone resin or nylon can be chosen.

The optical fiber 4 manufactured as described above is already formed with the coating layer 2 by an inorganic adhesive at the preform step; therefore, the optical fiber 4 obtained by the fiber drawing of the optical fiber preform 1 possesses a very hard (best guess; 1 character illegible) surface layer film (for example, a film formed by Al_2O_3) .....(Translator's note: Very likely, one line is not copied at the end of the page.)

Accordingly, during the fiber drawing, no surface scratch would be formed on the optical fiber 4 during the fiber drawing and after the fiber drawing. The coating layer 2 would also strongly, tightly adhered to the glass material portion of the optical fiber; thus it can become a highly reliable protective film without any peeling-off.

And when the inorganic system adhesive forming the aforementioned coating layer 2 is strongly alkaline or strongly acidic nature, the adhesive would dissolve/remove or eliminate the adhered dusts (occurred during the optical fiber preform step), the surface scratches, etc. ; thus the causes of strength degradation would be eliminated to further enhance the strength of the optical fiber 4.

Of course, the coating at the preform step can be performed simpler than that at the optical fiber step. It is convenient that the methods known so far can be freely chosen for performing the coating without difficulty (difficulty is best guess; 1 character poorly copied).

As described above, in the method of the present invention, a coating layer based on an inorganic adhesive is formed onto the outer circumference of the optical fiber

preform and this layer is hardened; then from this optical fiber preform (Translator's note: Underlined portion is added by the translator; it seems that a few words are not copied at the bottom the page), an optical fiber of high strength can be easily manufactured.

4. Brief Explanation of Figures

The figures are intended to show an implementation example of the method of the present invention. Fig 1 is the cross section of the state where a coating is formed onto the outer circumference of the optical fiber preform. Fig 2 is an illustrating diagram showing the fiber-drawn state of the above preform.

1...optical fiber preform

2...coating layer

3...spinning (fiber-drawing) furnace

4...optical fiber

Patent Applicant Agent, Attorney: M. Ito

Fig 1

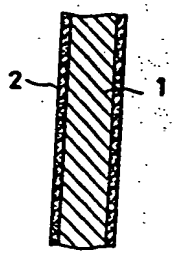

Fig 2